

STATEMENT OF WORK
FOR
LIQUID NITROGEN STORAGE AND DELIVERY SYSTEM
AUGUST 31, 2009

1. Background

- 1.1. The Flight Loads Laboratory (FLL) located at the NASA Dryden Flight Research Center (Edwards, California) routinely performs thermal tests that require the use of both liquid and gaseous nitrogen to facilitate cooling of test hardware and purging of test chambers. The FLL currently uses a 4000-gallon liquid nitrogen (LN2) trailer capable of delivering LN2 at pressures up to 55 psi. In the past, the FLL used a LN2 recharger to deliver gaseous nitrogen (GN2) that was capable of delivering temperature controlled GN2 at a volume flow rate of approximately 760 SCFM and a pressure of 100 psi. The LN2 recharger is no longer a system available to the FLL.
- 1.2. The FLL is looking to procure a liquid nitrogen storage and delivery system that combines the capability to deliver both LN2 and GN2. The following statement of work describes the specifications for the system that the government is seeking to purchase.
- 1.3. The project will be a design build procurement consisting of the following phases: A design phase and a construction phase. The vendor will be required to provide a total price for each phase. The vendor will be provided a notice to proceed for each of two phases.

2. Design Phase Scope

- 2.1. The vendor will provide 100% design drawings for review.
- 2.2. The vendor shall perform a site survey to identify and verify the system location and that adequate utilities are available to support the system.
- 2.3. The vendor shall design a turn-key liquid nitrogen storage and delivery system with the following specifications:
 - 2.3.1. 10,000-gallon fully insulated vertical LN2 storage tank.
 - 2.3.2. Ability to deliver LN2 at 55 psi to an existing vacuum jacketed 2" LN2 line for a period of 8 hours per day of use.
 - 2.3.3. Ability to deliver high-purity GN2 to an existing 2" plumbing connection at a volume flow rate of 2000 SCFM and at a pressure of 100 psi and within a temperature range from -60 to 80°F for a period of 8 hours per day of use.
 - 2.3.3.1. Volume flow rates, pressures and temperature are required to be adjustable.
 - 2.3.4. Ability to simultaneously deliver LN2 and GN2 as described in items 2.1.2 and 2.1.3.

- 2.3.5. The system shall have all of the required temperature sensors, pressure gages, liquid level gages and pressure relief devices that will allow safe operation of the system for both LN2 and GN2 operations
- 2.3.6. An emergency shutoff system that will safely shut off LN2 and GN2 delivery in the event of an emergency situation.
- 2.3.7. CGA fittings shall be used for filling the LN2 storage tank and for delivering LN2.
- 2.3.8. Cam-lock fittings will be utilized to connect to existing systems.
- 2.3.9. Local and remote control operation and monitoring of LN2 and GN2 delivery.
- 2.3.10. The pressure vessel shall be ASME Section VIII code stamped and registered with the National Board.
- 2.3.11. The process piping shall meet the requirements of ASME B31.3, Process Piping. Other piping shall meet the requirements of the most applicable ASME B31 series Code.
- 2.3.12. All system components shall be appropriate marks and labeled.
- 2.3.13. The concrete pad supporting the LN2 system shall be designed in accordance with the attached government and manufacturer specifications. The concrete pad shall be surrounded with appropriate safety barriers to protect the LN2 systems from damage caused by moving vehicles.
- 2.4. The system shall be capable of operating in the following environment:
 - 2.4.1. High dust environment.
 - 2.4.2. Temperature range from 0 to 120°F.
 - 2.4.3. Maximum sustained wind speeds of 85 mph.
 - 2.4.4. The concrete pad attachment points for the tank and other major equipment tie down points shall be engineered to meet Zone 4 seismic load requirements. The contractor shall have the drawings reviewed and stamped by a California Licensed Professional Engineer to verify the system is adequate for the intended purpose and installation in a Zone 4 seismic area

3. Construction Phase Scope

- 3.1. All phases of construction shall be conducted in accordance with the attached documents.
- 3.2. The vendor shall fabricate a concrete pad for supporting all system components.
- 3.3. The vendor shall submit a site specific Accident Prevention Plan to NASA for review and approval prior to the start of construction. The Accident Prevention Plan shall be prepared in accordance with the requirements set forth in the Section 01 35 14.11 40 of the Dryden Safety Requirements (July, 2007)
- 3.4. The vendor shall be responsible for certifying the liquid nitrogen storage and delivery system for LN2 and GN2 operations.

4. Deliverables

4.1. The vendor shall deliver the following:

- 4.1.1. One liquid nitrogen storage and delivery system designed and built to the specifications stated in Section 2.**
- 4.1.2. Preliminary design and critical design packages to the government for review prior to the next phase of design or construction.**
- 4.1.3. Engineering Drawings: Within 30 days after contract award, the contractor shall provide N2 system engineering drawings showing the system and the required site requirements.**
- 4.1.4. Final design drawings which detail all system components.**
- 4.1.5. Manufacturer's documentation on all system components.**
- 4.1.6. Certification documents on applicable system components.**
- 4.1.7. Operating procedures which describe step by step instructions for safely operating the system in both LN2 and GN2 delivery configurations.**
- 4.1.8. Requirement and procedures for preventative maintenance, calibration and inspections and replacement.**
- 4.1.9. On-site hands-on training for up 10 people.**